GCI-2K INSTALLATION AND OPERATOR'S MANUAL

Grid-tied inverter for wind

Ningbo Ginlong Technologies

1 INTRODUCTION

GCI-2K is a transformerless grid-tied inverter. It has a good response for wind speed change and a very wide input voltage range from 30Vdc to 750Vdc. The 40 points power curve that can be set by the display inside GCI-2k is very helpful for the turbine catching the wind energy better. Anyway, the GCI-2K is designed for small scale wind turbine system specially.

2 IMPORTANT SAFETY INSTRUCTIONS

The inverter has been engineered and manufactured to ensure your personal safety. Improper use may result in potential electrical shock or burns. Please read and follow all instructions for installation, use and servicing of this product.

INTENDED USE

The inverter is constructed as per the applicable safety-technical guidelines. Use the inverter ongly in installations that meet the following qualifications:

i) In permanent installations;

ii) Connected to a separate, grounded AC group, to which no other electrical equipment is connected;

iii) The electrical installation must meet the applicable regulations and standards, must be carried out correctly and must be in a good condition;

iv) Installed according to the instructions stated in this manual;

v) According to the technical specifications

3 INSTALLATION

3.1 Selecting a location for the inverter

In choosing a location for the inverter, consideration should be given to the following criteria:

3.1.1 The heat sink temperatures can exceed 75^{o}C. This product must be installed so that persons will not contact the top of the unit.

3.1.2 The inverter is suitable for installation both indoors and outdoors.

3.1.3 When the inverter is installed outdoors, it should be shielded from rain and direct sunlight, if possible.

3.1.4 The inverter is designed to suit for extremes temperature for most climates. The operating ambient temperature range is from -25 ^{o}C to 60 ^{o}C.

3.1.5 the following clearances are recommended for proper placement of the inverter: A minimum 500mm clearance between the bottom of the inverter and the ground; visibility of the operating LED’s and display located at the top front of the inverter box should be considered.

3.1.6 if the inverter is to be installed in an enclosed space, adequate ventilation must be provided.

3.2 Mounting the inverter

The inverter should be mounted vertically to a flat, solid surface such as wallboard, concrete or wood siding. The inverter should be located in close proximity to the turbine generator to

minimize the input wire length.

The mounting bracket provided makes mounting the inverter quick and simple. Inverter should be mounted in a vertical position as shown in Fig.3-1.

The package includes a hardware kit with four 5.5×38 stainless steel screws , four stainless steel washers and four SX8 wall plugs for installation of metal bracket to a masonry wall, two M5×25 stainless steel screws for installation of inverter to bracket .

3.2.1 Locate the wall studs in the desired location and align the mounting bracket over the studs. Mark the mounting holes. For concrete wall mounting the holes should be min. 8 mm in diameter and min. 40 mm deep. Ensure that locations A , B,C and D (in Fig.3-2) are aligned over the wall studs.

3.2.2 MAKE SURE BRACKET IS LEVEL.

Ensure points A , B,C and D (in Fig.3-2) are aligned with wall studs. Use 5.5×38 stainless steel screws , washers and SX8 wall plugs to A, B,C and D (in Fig.3-2) to the wall.

WARNING: Bracket shall be mounted vertically on wall.

3.2.3 Carefully hang the inverter on the upper part of the bracket so that the hooks located at the rear of the inverter hang over the bracket. Use M5×25 stainless steel screws and stainless steel washers to secure points G and H (in Fig.3-2) to the bracket .

Figure 3-1 Wall Mounting

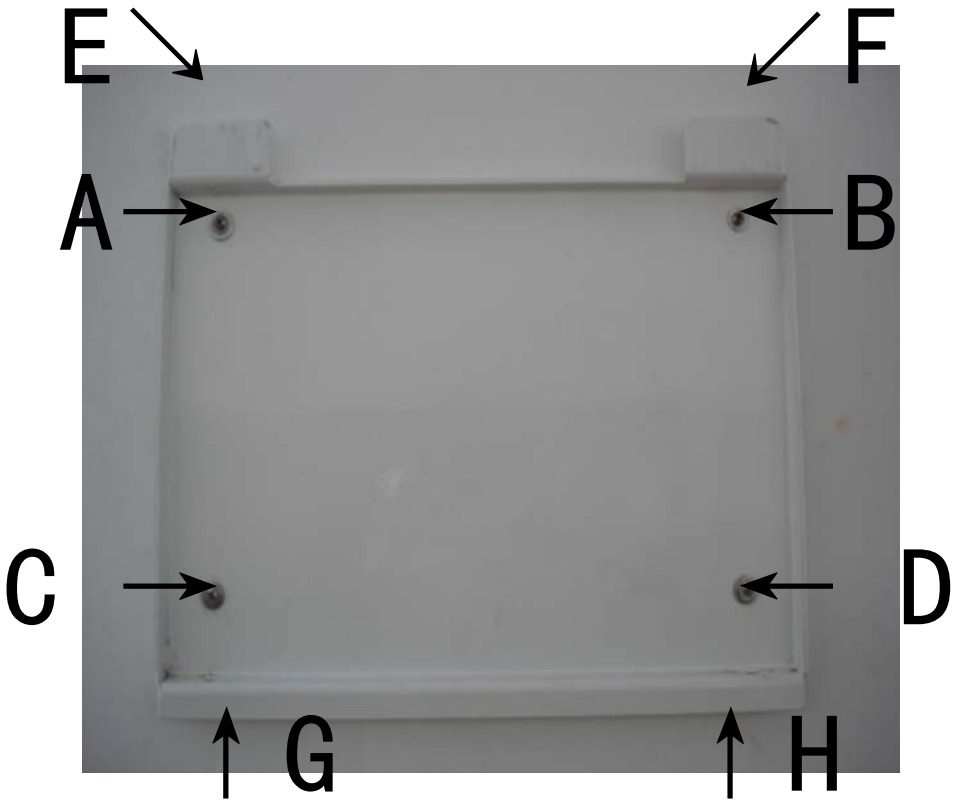

Figure 3-2 Mounting Bracket

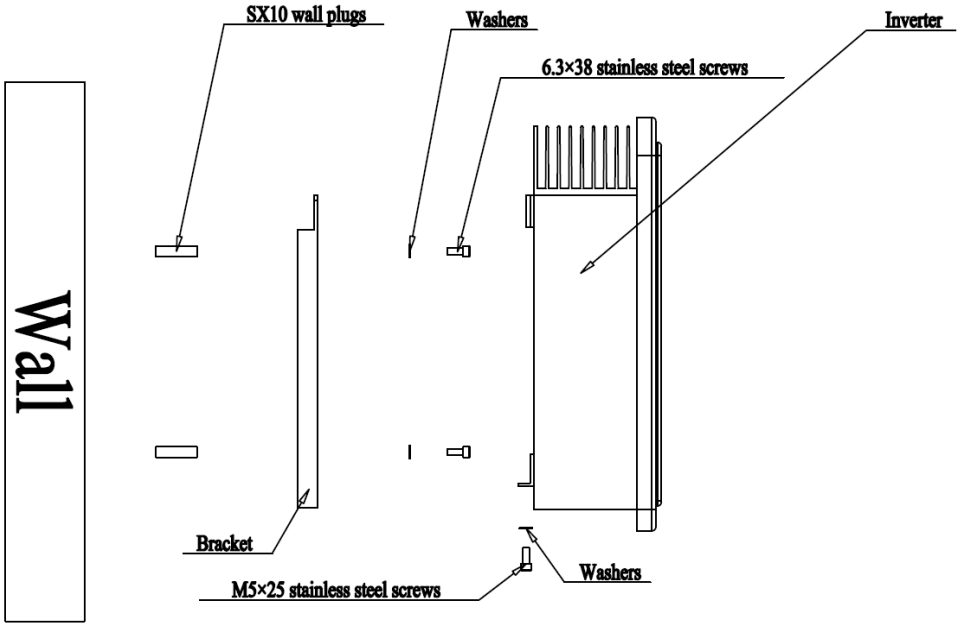

Figure 3-3 Inverter Mounting

3.3 Electrical connections

GCI-2K is designed for easy electrical connection, and the cover can be able to not open when connection.

3.3.1 open the AC grid disconnect switch

3.3.2 open the wind generator output AC disconnected switch.

3.3.3 connect GCI-2K to wind turbine output rectifier.

Ensure that output voltage polarity from the rectifier matches the “DC +” and “DC –” symbols. Connect the positive DC cable (refer to Fig.3-4) from the rectifier output positive terminal. Connect the negative DC cable (refer to Fig. 3-5) from the rectifier output negative terminal. Finally, connect the DC ± cable to the GCI-2K.

Figure 3-4 DC+ cable

Figure 3-5　　DC－ cable

3.3.2　　connect GCI-2K to the AC grid switch.

Each GCI-2K have a AC grid terminal connector that is showed in Fig.3-6. There are “L” “N” “⏚” symbol on the connector (refer to Fig3-7), the Line wire of grid must be connected to “L” terminal; the Neutral wire of grid must be connected to “N” terminal; the Earth of grid must be connected to “⏚” (refer to Fig.3-8).

Figure 3-6 AC terminal connector

Figure 3-7 grid terminal connector.2

Figure 3-8 connect the wires to grid terminal

Where, put to terminal coat to the terminal.

Figure 3-9 put the coat to the terminal

Where, put the connector to the GCI-2K.

Figure 3-10 connect the terminal to GCI-2K

Figure 3-11 the final electrical connector of GCI-2K

The final electrical connections is showed in Fig.3-11

4 Manipulate and monitor

In order to start up GCI-2K, the following step must be done:

i) Switch the Grid AC breaker ON. If the utility have the normal power supply, the GCI-2k turn on(the display red light on).

ii) Switch the wind generator breaker on.

iii) When both the inverter DC side and Grid side have the power, the inverter will prepare to generating. In the beginning, the inverter check the grid and inner inverter in order to ensure the inverter is ok and the grid voltage and frequency is ok. At this time the green light will glitter.

iv) After 3 minutes, the GCI-2k will generate electricity normally. This time, the green light will be on.

Do not touch the heat sink when the inverter is operating, because some parts may be hot and cause burns.

4.1 Overall view

Figure 4-1 Front Panel display

4.2 Status Indicator Lights

There are three status indicator lights on the cover of GCI-2K. The left POWER light (red) indicates power status of the inverter. The middle OPERATION light(green) indicates the operation status. The right ALARM light(yellow) indicates the alarm status. The following table explain the meanings(**Table 4-1**).

Table 4-1 Status Indicator lights

light	**Status**	**Description**
POWER	ON	The inverter is power on from the grid
	OFF	The inverter is power off.
OPERATION	ON	The inverter is operating correctly.
	OFF	The OPERATION light turns off indicates that inverter has stop generate electricity.
	BLINKING	The inverter is Initializing.
ALARM	ON	Alarm or fault condition is detected. The inverter stores last 10 messages.
	OFF	The inverter is operating correctly.

4.3 Keypad

There are four keys in the front of panel (from left to right): **ESC**, **UP**, **DOWN**, **ENTER KEYS**. The keypad is used for:

- Scroll the displayed parameter(**UP** and **DOWN** keys);
- Accessing and modifying the adjustable parameters (**ESC** and **ENTER** keys).

4.4 Display LCD

The two-line Liquid Crystal Display is located on the front panel of inverter.

The LCD shows:

- Inverter operation status and data;
- Service messages for operator;
- Alarm messages and fault indications.

During startup (5 sec), the LCD shows logo of company and model of inverter(see **Figure 4-2**).

Figure 4-2

During regular operation, the display will show the power and GCI-2K status alternately (see **Figure 4-3**). The display shows a different screen every 10 seconds. Screens can be scrolled manually by pressing the **UP** and **DOWN** keys. Pressing the **ENTER** key gives access to **Main Menu**.

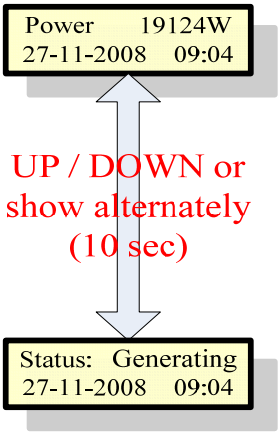

Figure 4-3

4.4.1 Main menu

There are four submenus in the main menu. Flowing:

- **Information**
- **Settings**
- **Advanced Info**.
- **Advanced Settings**

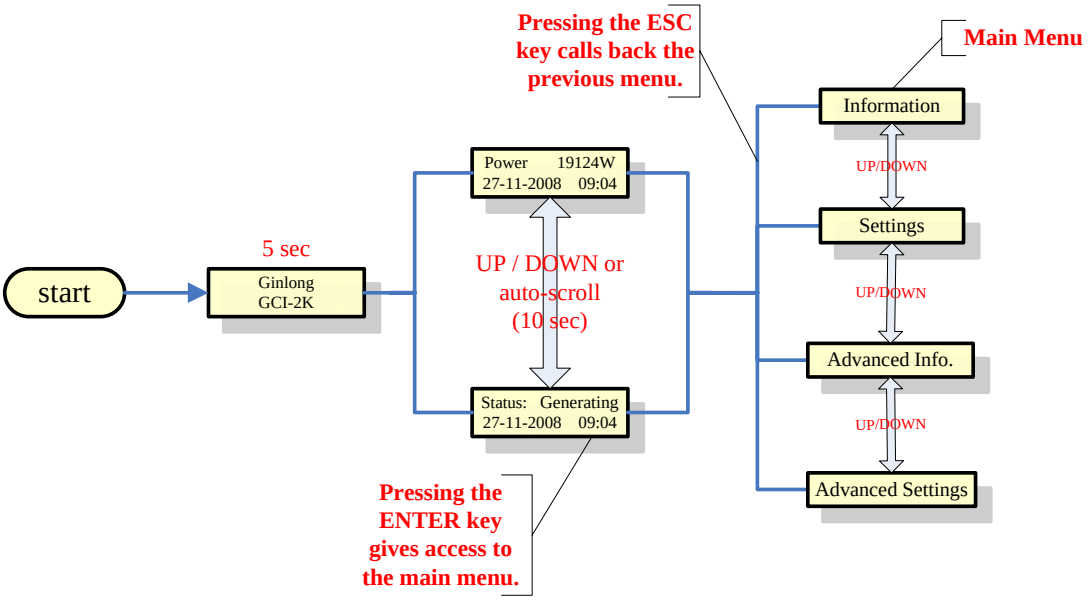

Figure 4-4 Startup Overall view

The display has 2 lines; use the keys at the side of the display to scroll through items or open the corresponding submenus. An arrow on the left side of the display highlights your current selection as shown in the following figure (**Figure 4-5**):

Figure 4-5

4.4.2 Information

Select the Information menu to display the information of inverter. These screens appear in the following order(**Table 4-2**).

Table 4-2 Information Indicator

Display	Duration	Description
V_DC 350.8 I_DC 5.1A	10 sec	**V_DC**: shows input voltage value. **I_DC**: shows input current value.
V_Grid 230.4V I_Grid 8.1A	10 sec	**V_Grid**: shows grid voltage value. **I_Grid**: shows grid current value.
Status: generating power: 1488W	10 sec	**Status**: shows instant status of GCI-2K. **Power**: shows instant output power value.
Grid Frequency F_Grid 50.06Hz	10 sec	**F_Grid**: shows instant frequency of grid value.

Total Energy 0258458 kwh	10 sec	Lifetime energy output value (since first clearing energy).
This Month: 0123kwh Last Month: 0123kwh	10 sec	**This Month**: Total energy output during this month. **Last Month**: Total energy output of last month.

During regular operation, the display will show the power and status of inverter alternately. The display shows a different screen every 10 seconds. Screens can be scrolled manually by pressing the **UP** and **DOWN** keys. Pressing the **ESC** key calls back the Main menu. At the same time, **ENTER** key can make the display lock (**Figure 4-7**) and unlock (**Figure 4-6**). Two figures is in the following.

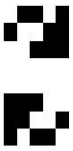

Figure 4-6

Figure 4-7

Table 4-3 Status Indicator

Display	**Description**
Generating	Generating electircity
Low wind	Wind is low and no output power
Initializing	Inverter is initializing and ready to operate

4.4.3 Settings

Select the **Settings** menu to display the following submenu:

- **Set Time**
- **Set Address**
- **Clear Energy**
- **Restore Settings**

An arrow on left side of the display highlights your current selection. When chosen item is selected, press **ENTER** key to open the submenu. Pressing the **ESC** key calls back the Main menu.

4.4.3.1 Set Time

This function allows time and data setting.

Pressing **UP/DOWN** keys to set time and data. Pressing **ENTER** key to move from one digit to the next (from left to right). Pressing the **ESC** key to save time and data setting, and calls back the pervious menu.

The screen shows in the following figure:

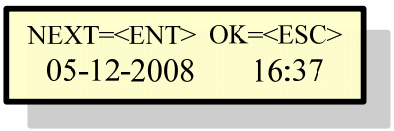

Figure 4-7

4.4.3.2 Set Address

This function is used to set addresses for communication of the single inverters connected in the system on RS485 line. You can assign number from 1 to 99.

Pressing **UP/DOWN** keys to set address. Pressing **ENTER** key to complete setting of address. Pressing **ESC** key to cancel pervious setting and call back pervious menu.

The screen shows in the following figure:

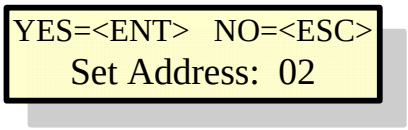

Figure 4-8

4.4.3.3 Clear Energy

This function is used to clear energy (total energy, this month energy and last month energy). When selecting **Clear Energy**, the screen shows in the following figure:

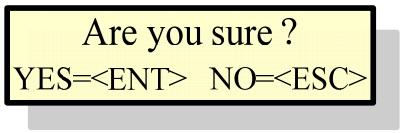

Figure 4-9

Pressing **ENTER** key to make sure it setting. Pressing **ESC** key to cancel pervious setting and call back pervious menu.

4.4.3.4 Restore Settings

This function is used to restore settings (see **Figure 4-10**). You must set **Grid OFF** before select it. If not, the screen will show in the following figure:

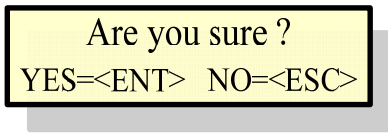

Figure 4-10

Figure 4-11

Pressing **ENTER** key to make sure it setting. Pressing **ESC** key to cancel pervious setting and call back pervious menu.

4.5 Advanced Info.

Select **Advanced Info.** from the Main menu to display the first screen, that refers to the password (see **Figure 4-12**). Type in the correct password and press ENTER to access all information in the following:

- **Alarm Message**
- **Temperature**
- **STD NO. & Curve NO.**
- **Version**
- **Communication Data**

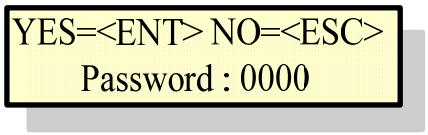

Figure 4-12

Screens can be scrolled manually by pressing the **UP** and **DOWN** keys. Pressing the **ENTER** key gives access to **Main Menu**. Pressing the **ENTER** key access to submenu.

NOTE: The default password is "0010"

4.5.1 Alarm Message

The display shows 10 alarm messages recently. Screens can be scrolled manually by pressing the **UP** and **DOWN** keys. Pressing the **ESC** key calls back the pervious menu.

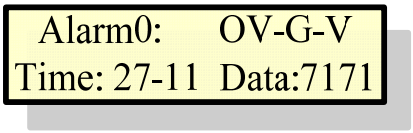

Figure 4-13

4.5.2 Temperature

The screen shows the power module temperature of GCI-2K.

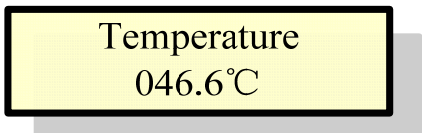

Figure 4-14

4.5.3 STD NO. & Curve NO.

STD NO.: shows the reference standard of GCI-2K.

Curve NO.: shows power curve version.

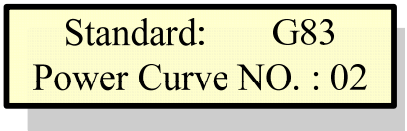

Figure 4-15

4.5.4 Version

Model: shows the model of GCI-2K.

Software Version: shows the software version .

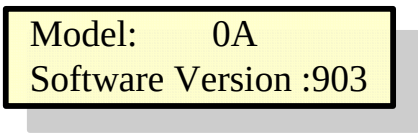

Figure 4-16

4.5.5 Communication Data

Shows the GCI-2K inner data. Just for the service person.

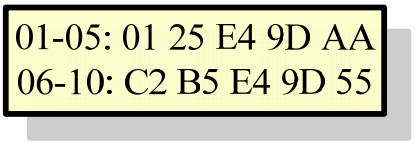

Figure 4-17

4.6 Advanced Settings

Select **Advanced Settings** from the Main menu to display the first screen, that refers to the password. Type in the correct password and press ENTER to access all information in the following:

- **Power Curve**
- **Select Standard**
- **Grid ON/OFF**
- **New Password**

4.6.1 Power Curve

Select the **Power Curve** menu to display the following submenu:

- **Set power Curve**
- **Select Power Curve**

This function is used to set and select power curve.

NOTE: in order to make the function availability, you must set **Grid OFF** first (please see 4.6.3) .

A) **Set Power Curve**

Figure 4-18

This function is setting the power curve data by customer.

Please choose the version number of the setting power curve data which is from 01 to 03(see **Fig.4-19)**.

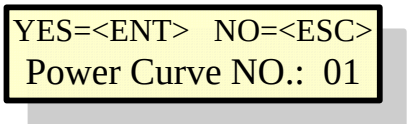

Figure 4-19

And then, set power curve:

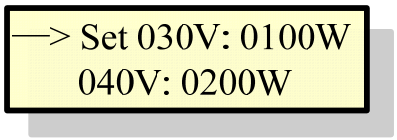

Figure 4-20

Pressing **UP/DOWN** keys to set power curve. Pressing **ENTER** key to move from power digit to the next (from left to right). Press the **ECS** key to save and send power curve **(** see **Figure 4-21)**.

Figure 4-21

NOTE：In order to make the power curve setting availability, GCI-2K must be set GRID-ON NOW (see 4.6.3**).**

When customer set the power curve (01—03), the power curve data will save to the EEPROM. Next starting the GCI-2K, the power curve data can be used directly.

B) **Select Power Curve**

This function is choosing the power curve number. When you have set the power curve data, you can choose the power curve number which you what to run by this function.

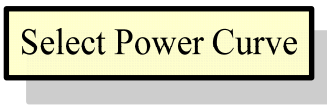

Figure 4-22

NOTE: in order to make the function availability, you must set **Grid OFF** first (please see 4.6.3)

Select the **Power Curve** menu to display the following:

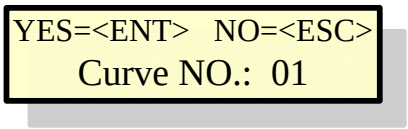

Figure 4-23

Press the **ENTER** key to save and send power curve. Pressing **ESC** key to cancel pervious setting and call back pervious menu. In this menu, you can select four power curve number from 01 to 04. The 01,02,03 power curve is the user edit ; the 04 power curve is the GCI-2K default value and be not able to change (refer to Table 4-4).

Table 4-4 the 04 number power curve

DC value (V)	Power (W)	DC value (V)	Power (W)
30	0	230	990
40	0	240	1050
50	0	250	1110
60	0	260	1170

70	10	270	1220
80	50	280	1300
90	90	290	1400
100	140	300	1500
110	200	310	1600
120	260	350	1800
130	320	390	2000
140	380	430	2000
150	440	470	2000
160	500	510	2000
170	570	550	2000
180	650	590	2000
190	730	630	2000
200	810	670	2000
210	890	710	2000
220	930	750	2000

NOTE：In order to make the power curve setting availability, GCI-2K must be set GRID-ON NOW (see 4.6.3**).**

4.6.2 Select Standard

This function is used to select reference standard of grid (see **Figure 4-20**).

Pressing **UP/DOWN** keys to select standard **(AS4777, VDE0126, UL1741, G83, User-Def)**. Pressing **ENTER** key to complete selection. Pressing **ESC** key to cancel pervious setting and call back pervious menu.

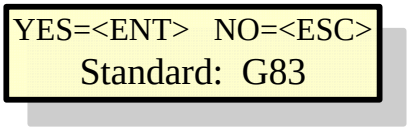

Figure 4-24

Select the **User-Def** menu to display the following submenu:

- **OV-V**: 240---265V
- **UN-V**: 180---210V
- **OV-G-F**: 50.3---52.0Hz(60.3—62.0Hz)
- **UN-G-F**: 47.0---49.5Hz(57.0—59.5Hz)

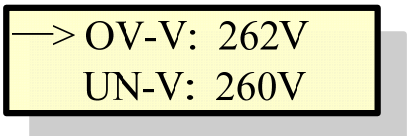

Figure 4-25

Press the **UP/DOWN** keys to scroll through items. Press the **ECS** key to save and send standard of grid. Press the **ENTER** key to set standard of grid.

NOTE: in order to make the function availability, you must set **Grid OFF**

4.6.3 Grid ON/OFF

This function is making the inverter generate electricity or not.

Screens can be scrolled manually by pressing the **UP** and **DOWN** keys. Pressing **ENTER** key to make sure it setting. Pressing **ESC** key to call back pervious menu.

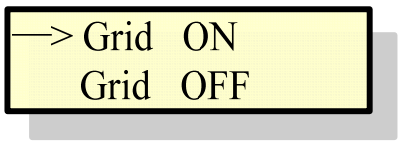

Figure 4-26

4.6.4 New Password

This function is used to change the password.

The first time set a new password.

Figure 4-27

Verify new password.

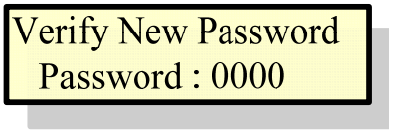

Figure 4-28

Setting is ok.

Figure 4-29

If verify new password failed, the screen will shows in the following:

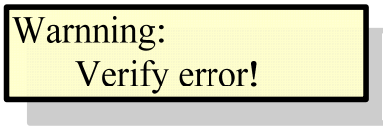

Figure 4-30

5 SPECIFICATIONS

The DC input range	30V~750Vdc
The rating max dc input current	9Adc
The grid voltage range	180～260Vac (adjustable)
Operation phase	single
Rating grid output current	8.7Aac
Rating output power	2kW
The transient max power	2.2kW
Grid current THD	Total THd<4%,
The dc injection current	<10mA
Output power factor	>0.99
Grid frequency range	50Hz/60Hz (adjustable)
efficiency	94%
Design lifetime	>20 years
Input/output to shell isolation	5M
operation environment temperature	－25～60^{o}C